

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1-43. (Cancelled)

44. (New) An integrated optical waveguide having an in-line light sensor integrally formed therewith, comprising: a first part of the waveguide leading to a photodiode portion thereof; a second part of the waveguide leading away from the photodiode portion, the material from which said first and second parts of the waveguide are formed having an energy band gap the magnitude of which corresponds to absorption of photons of a first wavelength, the photodiode portion comprising one or more regions of light absorbing material within the waveguide arranged to absorb a minor proportion of light of one or more selected wavelengths transmitted along the waveguide (so a major proportion of the light passes through to the second part of the waveguide) to thereby generate free charge carriers within the photodiode portion of the waveguide, the photodiode portion being modified to introduce deep band gap levels therein so as to provide at least partial absorption of photons of a selected wavelength or wavelength band greater than said first wavelength; and detecting means for detecting the presence of said free charge carriers.

45. (New) A waveguide as claimed in claim 44 in which the modification comprises the presence of defects in the intrinsic region.

46. (New) A waveguide as claimed in claim 45 in which the defects comprise defects in the crystalline structure of the photodiode portion.

47. (New) A waveguide as claimed in claim 45 in which the defects comprise elemental impurities within the photodiode portion.

48. (New) A waveguide as claimed in claim 44 in which the deep band gap levels are formed by ion implantation.

49. (New) A waveguide as claimed in claim 48 in which the defects are formed by hydrogen (proton) implantation.

50. (New) A waveguide as claimed in claim 44 in which the detecting means comprises a diode.

51. (New) A waveguide as claimed in claim 50 in which the diode is p-i-n diode comprising a p-doped region, and an n-doped region in electrical contact with a nominally

intrinsic region begin located so the majority of light transmitted along the waveguide passes therethrough.

52. (New) A waveguide as claimed in claim 51 in which the nominally intrinsic region is relatively lightly doped with p-dopant adjacent said p-doped region and n-dopant adjacent said n-doped region.

53. (New) A waveguide as claimed in claim 51 in which the p-i-n diode is a lateral p-i-n diode.

54. (New) A waveguide as claimed in claim 51 in which the p-i-n diode is a vertical p-i-n diode.

55. (New) A waveguide as claimed in claim 44 which is a rib waveguide comprising a rib projecting from a slab region.

56. (New) A waveguide as claimed in claim 51, wherein the waveguide is a rib waveguide comprising a rib projecting from a slab region, and wherein the p- and n- doped regions are formed on opposite sides of the rib waveguide.

57. (New) A waveguide as claimed in claim 51, wherein the waveguide is a rib waveguide comprising a rib projecting from a slab region, and wherein the p-doped region is formed on one side or both sides of the rib waveguide and the n-doped region is formed on top of the rib waveguide, or vice versa.

58. (New) A waveguide as claimed in claim 56 in which the p-doped and/or n-doped regions are formed at the base of one or more recesses formed in the slab region.

59. (New) A waveguide as claimed in claim 55 in which said photodiode portion is, at least partially, within the rib of the rib waveguide.

60. (New) A waveguide as claimed in claim 44 in which the refractive index of the material thereof and/or the dimensions thereof are selected so as to provide similar confinement factors for both the TE and TM modes whereby the detection of light thereby is substantially polarization independent.

61. (New) A waveguide as claimed in claim 44 which is formed of silicon.

62. (New) A waveguide as claimed in claim 61 formed on a silicon-on-insulator chip.

63. (New) A waveguide as claimed in claim 44 in which the selected wavelength band is around 1.3 or 1.5 microns.

64. (New) A method of fabricating a waveguide as claimed in claim 44 in which the photodiode portion and the detecting means are fabricated by one or more of the following: lithographic techniques, doping and ion implantation.

65. (New) A method as claimed in claim 64 in which the material from which the waveguide is formed has an energy band gap the magnitude of which corresponds to absorption of photons of a first wavelength and the photodiode portion thereof is modified to introduce deep band gap levels therein so as to provide at least partial absorptions of photons of a selected wavelength or wavelength band greater than said first wavelength.

66. (New) A method as claimed in claim 65 in which the modification is by ion implantation.

67. (New) A method as claimed in claim 66 in which one or more of the following species is implanted: gold, oxygen, germanium, carbon, hydrogen, helium, and silicon atoms or ions.

68. (New) A waveguide as claimed in claim 44 having a wavelength selective reflector means being arranged to reflect light of said selected wavelength or range of wavelengths so it passes repeatedly through the photodiode.

69. (New) A waveguide as claimed in claim 68 in which the reflective means comprises first and second reflectors.

70. (New) A waveguide as claimed in claim 69 in which the first and second reflectors are provided in the first and second parts of the waveguide on opposite sides of the diode portion.

71. (New) A waveguide as claimed in claim 69 in which at least one of the first and second reflectors comprises a Bragg grating.

72. (New) A waveguide as claimed in claim 68 in which the in-line light sensor is tunable so as to be sensitive to one or more selected wavelengths or wavelength bands.

73. (New) A waveguide as claimed in claim 72 in which first wavelength control means are provided to adjust the wavelength or band of wavelengths reflected by the reflector means.

74. (New) A waveguide as claimed in claim 72 in which second wavelength control means are provided to adjust the wavelength or band of wavelengths absorbed within the diode portion.

75. (New) A waveguide as claimed in claim 72 in which the in-line light sensor can be scanned over a range of wavelengths to provide a spectral analysis of the light received.

76. (New) A waveguide as claimed in claim 44 comprising an optical attenuator for attenuating the light passing through the in-line light sensor.

77. (New) A waveguide as claimed in claim 76 in which said attenuator is a variable optical attenuator.

78. (New) A waveguide as claimed in claim 44 having two or more in-line light sensors arranged in series or in parallel.

79. (New) A waveguide as claimed in claim 78 in which each in-line light sensor is arranged to be sensitive to a different wavelength or wavelength band.

80. (New) A waveguide as claimed in claim 78 arranged in series along a substantially straight line conductive path.

81. (New) A waveguide as claimed in claim 78 arranged in series along a serpentine light conductive path.

82. (New) A waveguide as claimed in claim 81 formed on a substrate, said substrate having optical and/or electrical isolation devices formed therein positioned so as to assist in optically and/or electrically isolating different portions of said serpentine path from each other.

83. (New) A waveguide as claimed in claim 78 each having a variable optical attenuator in series therewith.

84. (New) A waveguide as claimed in claim 78 arranged to form an optical channel monitor for monitoring the individual channels of a multi-wavelength optical signal.

85. (New) An integrated optical waveguide having an in-line light sensor integrally formed thereon with the light sensor comprising a p-i-n diode formed in a semiconductor substrate having an energy band gap the magnitude of which corresponds to absorptions of photons of a first wavelength, the photodiode comprising a substantially intrinsic region in said

semiconductor substrate between p- and n-doped regions, the intrinsic region being modified to introduce deep band gap levels therein so as to provide at least partial absorption of photons of an optical signal of a selected wavelength or wavelength band greater than said first wavelength and thus generate an electrical signal across the p-i-n diode indicative of said optical signal, said photodiode being provided within a resonant cavity.